

Application No. 09/593,591
Amendment dated May 18, 2007
Reply to Office Action of February 12, 2007

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) An Interbody spinal implant made of cortical bone for insertion at least in part into an implantation space formed across the height of a disc space between adjacent vertebral bodies of a human spine and into at least a portion of the endplates of the vertebral bodies, the implantation space having a front wall, said implant comprising:

a body manufactured from a bone ring having a medullary canal obtained from a major long bone of a human, said body having a perimeter with a leading end, a trailing end opposite said leading end and a length therebetween, and opposite exterior sides, said body having a mid-longitudinal axis passing through said leading and trailing ends, said leading end having a straight portion in a direction from one of said opposite exterior sides to another of said opposite exterior sides along a portion of the perimeter of said body adapted to abut the front wall of the implantation space when said implant is installed into the implantation space;

opposite upper and lower surfaces adapted to be placed in contact with and to support the adjacent vertebral bodies, said upper and lower surfaces being non-arcuate;

said opposite exterior sides connecting said upper and lower surfaces and said leading and trailing ends, said opposite exterior sides of said implant having straight portions that are generally parallel to each other; and

an opening coincident with the medullary canal passing through said upper and lower surfaces for permitting for the growth of bone from adjacent vertebral body to adjacent vertebral body through said implant, said opening

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being between said straight portions of said opposite exterior sides and having a maximum width transverse to the mid-longitudinal axis of said body, a majority of said opening being between having a perimeter located closer to said leading end than said trailing end of said body and a plane perpendicular to and bisecting the length of said body along the mid-longitudinal axis, said trailing end having a non-linear portion between two lines parallel to the mid-longitudinal axis, the parallel lines being spaced apart from one another on opposite sides of the mid-longitudinal axis and intersecting the maximum width of said opening.

2. (previously presented) The implant of claim 1, wherein said straight portion of said leading end is generally oriented at 90 degrees to the mid-longitudinal axis of the implant.

Claim 3 (cancelled).

4. (previously presented) The implant of claim 1, wherein said straight portion of said at least one side is generally oriented 90 degrees to said straight portion of said leading end.
5. (previously presented) The Implant of claim 1, wherein said straight portion of said at least one side is oriented generally parallel to the mid-longitudinal axis of said implant.

Claim 6 (cancelled).

7. (original) The implant of claim 1, further comprising at least one protrusion extending from at least one of said upper and lower surfaces for engaging at least one of the adjacent vertebral bodies to maintain said implant within the implantation space.
8. (original) The implant of claim 7, wherein said protrusion comprises at least one of a ridge, ratcheting, spline, and knurling.
9. (original) The implant of claim 1, wherein said upper and lower surfaces are porous.
10. (original) The implant of claim 1, wherein said upper and lower surfaces include

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a bone ingrowth surface.

11. (original) The implant of claim 1, wherein the perimeter of said body forms at least a portion of a ring.
12. (original) The implant of claim 1, wherein said implant has a closed perimeter.
13. (original) The implant of claim 1, wherein said implant has an open perimeter for providing access to said opening.
14. (original) The implant of claim 1, wherein said implant is generally rectangular in shape.
15. (original) The implant of claim 1, wherein said implant is generally oval in shape.
16. (original) The implant of claim 1, wherein at least a portion of said upper and lower surfaces are in an angular relationship to each other from trailing end to leading end for allowing angulation of the adjacent vertebral bodies relative to each other.
17. (original) The implant of claim 1, wherein at least a portion of said leading end is tapered for facilitating insertion of said implant between the two adjacent vertebral bodies.
18. (original) The implant of claim 1, wherein said implant is adapted for insertion from the anterior aspect of the vertebral bodies and said trailing end is configured to conform to the anatomic contour of at least a portion of the anterior aspect of the vertebral bodies.
19. (original) The implant of claim 1, wherein said implant has a maximum length less than and approximating the posterior to anterior depth of the vertebral bodies.
20. (original) The implant of claim 1, wherein said implant has a width greater than one half the width of the adjacent vertebral bodies.

Claim 21 (cancelled).

22. (original) The implant of claim 1, wherein said opening is compressively loaded with fusion promoting material.

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23. (original) The implant of claim 1, further comprising at least a second opening passing through said upper and lower surfaces for permitting for the growth of bone from adjacent vertebral body to adjacent vertebral body through said implant.
24. (original) The implant of claim 23, wherein said second opening communicates with said opening.
25. (original) The implant of claim 1, further comprising a plurality of openings and passages adapted to retain a fusion promoting substance.
26. (previously presented) The implant of claim 1, in combination with at least one bone screw adapted to engage at least one vertebral body when inserted through said implant.
27. (previously presented) The implant of claim 26, further comprising a lock for locking said at least one bone screw to said implant.
28. (original) The implant of claim 27, wherein said lock is made of one of cortical bone and a bioresorbable material.
29. (previously presented) The implant of claim 26, wherein said at least one bone screw is made of one of cortical bone and a bioresorbable material.
30. (original) The implant of claim 1, wherein said implant is manufactured from one of a diaphyseal bone and from a metaphyseal bone.

Claim 31 (cancelled).

32. (original) The implant of claim 1, further in combination with fusion promoting substances.
33. (original) The implant of claim 1, in combination with a fusion promoting material other than bone.
34. (original) The implant of claim 1, wherein said implant comprises a bone ingrowth material other than bone.
35. (original) The implant of claim 1, further comprising a material, other than the bone from which said implant is formed, that intrinsically participates in the

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growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.

36. (previously presented) The implant of claim 33, wherein said fusion promoting material is bone morphogenetic protein.
37. (original) The implant of claim 1, further in combination with bone morphogenetic protein.
38. (original) The implant of claim 1, further in combination with an osteogenic material.
39. (original) The implant of claim 38, wherein said osteogenic material is a material other than bone.
40. (original) The implant of claim 38, wherein said material is genetic material coding for the production of bone.
41. (original) The implant of claim 1, further in combination with genetic material coding for production of bone.
42. (original) The implant of claim 1, further in combination with a chemical substance to inhibit scar formation.
43. (withdrawn) An interbody spinal implant made of a bone composite material for insertion at least in part into an implantation space formed across the height of a disc space between adjacent vertebral bodies of a human spine and into at least a portion of the endplates of the vertebral bodies, the implantation space having a front wall, said implant comprising:

a body manufactured from a bone composite material, said body having a perimeter with a leading end, a trailing end opposite said leading end, and opposite exterior sides, said body having a mid-longitudinal axis passing through said leading and trailing ends, said leading end having a generally straight portion in a direction from one of said opposite exterior sides to another of said opposite exterior sides along a portion of the perimeter of said body adapted to abut the front wall of the implantation space when said implant is installed into

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the implantation space;

opposite upper and lower surfaces adapted to be placed in contact with and to support the adjacent vertebral bodies, said upper and lower surfaces being non-arcuate;

said opposite exterior sides connecting said upper and lower surfaces and said leading and trailing ends, said opposite exterior sides of said implant having straight portions that are generally parallel to each other; and

an opening passing through said upper and lower surfaces for permitting for the growth of bone from adjacent vertebral body to adjacent vertebral body through said implant, said opening being between said straight portions of said opposite exterior sides and having a maximum width transverse to the mid-longitudinal axis of said body, said trailing end having a non-linear portion between two lines parallel to the mid-longitudinal axis, the parallel lines being spaced apart from one another on opposite sides of the mid-longitudinal axis and intersecting the maximum width of said opening.

44. (withdrawn) The implant of claim 43, wherein said straight portion of said leading end is generally oriented at 90 degrees to the mid-longitudinal axis of the implant.

Claim 45 (cancelled).

46. (withdrawn) The implant of claim 43, wherein said straight portion of said at least one side is generally oriented 90 degrees to said straight portion of said leading end.
47. (withdrawn) The implant of claim 43, wherein said straight portion of said at least one side is oriented generally parallel to the mid-longitudinal axis of said implant.

Claim 48 (cancelled).

49. (withdrawn) The implant of claim 43, further comprising at least one protrusion extending from at least one of said upper and lower surfaces for engaging at least one of the adjacent vertebral bodies to maintain said implant within the

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implantation space.

- 50. (withdrawn)The implant of claim 49, wherein said protrusion comprises at least one of a ridge, ratcheting, spline, and knurling.
- 51. (withdrawn)The implant of claim 43, wherein said upper and lower surfaces are porous.
- 52. (withdrawn) The implant of claim 43, wherein said upper and lower surfaces include a bone ingrowth surface.
- 53. (withdrawn) The implant of claim 43, wherein the perimeter of said body forms at least a portion of a ring.
- 54. (withdrawn) The implant of claim 43, wherein said implant has a closed perimeter.
- 55. (withdrawn)The implant of claim 43, wherein said implant has an open perimeter for providing access to said opening.
- 56. (withdrawn) The implant of claim 43, wherein said implant is generally rectangular in shape.
- 57. (withdrawn)The Implant of claim 43, wherein said implant is generally oval in shape.
- 58. (withdrawn) The implant of claim 43, wherein at least a portion of said upper and lower surfaces are in an angular relationship to each other from trailing end to leading end for allowing angulation of the adjacent vertebral bodies relative to each other.
- 59. (withdrawn) The implant of claim 43, wherein at least a portion of said leading end is tapered for facilitating insertion of said implant between the two adjacent vertebral bodies.
- 60. (withdrawn) The implant of claim 43, wherein said implant is adapted for insertion from the anterior aspect of the vertebral bodies and said trailing end is configured to conform to the anatomic contour of at least a portion of the anterior aspect of the vertebral bodies.

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61. (withdrawn) The implant of claim 43, wherein said implant has a maximum length less than and approximating the posterior to anterior depth of the vertebral bodies.
62. (withdrawn) The implant of claim 43, wherein said implant has a width greater than one half the width of the adjacent vertebral bodies.
63. (withdrawn) The implant of claim 43, wherein said opening is compressively loaded with fusion promoting material.
64. (withdrawn) The implant of claim 43, further comprising at least a second opening passing through said upper and lower surfaces for permitting for the growth of bone from adjacent vertebral body to adjacent vertebral body through said implant.
65. (withdrawn) The implant of claim 64, wherein said second opening communicates with said opening.
66. (withdrawn) The implant of claim 43, further comprising a plurality of openings and passages adapted to retain a fusion promoting substance.
67. (withdrawn) The implant of claim 43, in combination with at least one bone screw adapted to engage at least one vertebral body when inserted through said implant.
68. (withdrawn) The implant of claim 67, further comprising a lock for locking said at least one bone screw to said implant.
69. (withdrawn) The implant of claim 68, wherein said lock is made of one of cortical bone and a bioresorbable material.
70. (withdrawn) The implant of claim 67, wherein said at least one bone screw is made of one of cortical bone and a bioresorbable material.
71. (withdrawn) The implant of claim 43, wherein said composite material includes filaments of bone.
72. (withdrawn) The implant of claim 43, wherein said composite material includes a bioresorbable plastic.

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73. (withdrawn) The implant of claim 43, wherein said composite material includes ceramic.
74. (withdrawn) The implant of claim 43, further in combination with fusion promoting substances.
75. (withdrawn) The implant of claim 43, in combination with a fusion promoting material other than bone.
76. (withdrawn) The implant of claim 43, wherein said implant comprises a bone ingrowth material other than bone.
77. (withdrawn) The implant of claim 43, further comprising a material, other than the bone from which said implant is formed, that intrinsically participates in the growth of bone from one of the adjacent vertebral bodies to the other of the adjacent vertebral bodies.
78. (withdrawn) The implant of claim 75, wherein said fusion promoting material is bone morphogenetic protein.
79. (withdrawn) The Implant of claim 43, further in combination with bone morphogenetic protein.
80. (withdrawn) The implant of claim 43, further in combination with an osteogenic material.
81. (withdrawn) The implant of claim 80, wherein said osteogenic material is a material other than bone.
82. (withdrawn) The implant of claim 81, wherein said material is genetic material coding for the production of bone.
83. (withdrawn) The implant of claim 43, further in combination with genetic material coding for production of bone.
84. (withdrawn) The implant of claim 43, in combination with a chemical substance to inhibit scar formation.
85. (currently amended) An interbody spinal implant made of cortical bone for insertion at least in part into an implantation space formed across the height of a

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disc space between adjacent vertebral bodies of a human spine and into at least a portion of the endplates of the vertebral bodies, the implantation space having a front wall, said implant comprising:

a body manufactured from a bone ring having a medullary canal obtained from a major long bone of a human, said body having a perimeter with a leading end, a trailing end opposite said leading end and a length therebetween, and opposite exterior sides therebetween, said body having a mid-longitudinal axis passing through said leading and trailing ends, said leading end having a straight portion in a direction from one of said opposite exterior sides to another of said opposite exterior sides along a part of the perimeter of said body adapted to abut the front wall of the implantation space when said implant is installed into the implantation space;

opposite upper and lower surfaces adapted to be placed in contact with and to support the adjacent vertebral bodies, said upper and lower surfaces being non-arcuate;

said opposite exterior sides connecting said upper and lower surfaces and said leading and trailing ends, said opposite exterior sides of said implant having straight portions that are generally parallel to each other;

an opening coincident with the medullary canal passing through said upper and lower surfaces for permitting for the growth of bone from adjacent vertebral body to adjacent vertebral body through said implant, said opening being between said straight portions of said opposite exterior sides and having a maximum width transverse to the mid-longitudinal axis of said body, a majority of said opening being between ~~having a perimeter located closer to said leading end than said trailing end of said body~~ and a plane perpendicular to and bisecting the length of said body along the mid-longitudinal axis, said trailing end having a non-linear portion between two lines parallel to the mid-longitudinal axis, the parallel lines being spaced apart from one another on opposite sides of

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the mid-longitudinal axis and intersecting the maximum width of said opening;
and

said implant being formed by the process of cutting a section of a long bone in a direction transverse to the longitudinal axis of the long bone to form at least a portion of a bone ring and machining said leading end to form said straight portion.

86. (original) The implant of claim 85, wherein said straight portion of said leading end is generally oriented at 90 degrees to the mid-longitudinal axis of the implant.

Claim 87 (cancelled).

88. (previously presented) The implant of claim 85, wherein said straight portion of said at least one side is generally oriented 90 degrees to said straight portion of said leading end.
89. (previously presented) The implant of claim 85, wherein said straight portion of said at least one side is oriented generally parallel to the mid-longitudinal axis of said implant.

Claim 90 (cancelled).

91. (original) The Implant of claim 85, further comprising at least one protrusion extending from at least one of said upper and lower surfaces for engaging at least one of the adjacent vertebral bodies to maintain said implant within the disc space.
92. (original) The implant of claim 91, wherein said protrusion comprises at least one of a ridge, ratcheting, spline, and knurling.
93. (original) The implant of claim 85, wherein said upper and lower surfaces are porous.
94. (original) The implant of claim 85, wherein said upper and lower surfaces include a bone ingrowth surface.

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95. (original) The implant of claim 85, wherein the perimeter of said body forms at least a portion of a ring.
96. (original) The implant of claim 85, wherein said implant has a closed perimeter.
97. (original) The implant of claim 85, wherein said implant has an open perimeter for providing access to said opening.
98. (original) The implant of claim 85, wherein said implant is generally rectangular in shape.
99. (original) The implant of claim 85, wherein said implant is generally oval in shape.
100. (original) The implant of claim 85, wherein at least a portion of said upper and lower surfaces are in an angular relationship to each other from trailing end to leading end for allowing angulation of the adjacent vertebral bodies relative to each other.
101. (original)) The implant of claim 85, wherein at least a portion of said leading end is tapered for facilitating insertion of the implant between the two adjacent vertebral bodies.
102. (original) The implant of claim 85, wherein said implant is adapted for insertion from the anterior aspect of the vertebral bodies and said trailing end is configured to conform to the anatomic contour of at least a portion of the anterior aspect of the vertebral bodies.

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